

FEDERAL SPECIFICATION

ALUMINUM ALLOY, BAR, ROD, SHAPES, STRUCTURAL
SHAPES, TUBE AND WIRE, EXTRUDED:
GENERAL SPECIFICATION FOR

This specification was approved by the Commissioner,
Federal Supply Service, General Services Administration
for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the general requirements for aluminum alloy bar, rod, shapes, structural shapes, tube and wire, extruded. Specific requirements for these products in a particular alloy are covered by the applicable detailed specification (see 6.3).

1.2 Classification.

1.2.1 Tempers. Bar, rod, shapes, structural shapes, tube and wire shall be classified in tempers as specified in the detailed specification. The definitions of tempers shall be as specified in American National Standard ANSI H35.1.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

Federal Standards:

Fed. Std. No. 123	-Marking for Shipment (Civil Agencies)
Fed. Test Method	-Metals; Test Methods.
Std. No. 151	
Fed. Std. No. 184	-Identification Marking of Aluminum, Magnesium and Titanium.

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions, as outlined under General Information in the Index of Federal Specifications, Standards and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification, other Federal specifications, standards, and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston; New York; Philadelphia; Washington, DC; Atlanta; Chicago; Kansas City, MO; Fort Worth; Houston; Denver; San Francisco; Los Angeles; and Seattle, WA.

(Federal Government activities may obtain copies of Federal specifications, standards, commercial item descriptions, and the Index of Federal Specifications, Standards and Commercial Item Descriptions from established distribution points in their agencies.)

Military Specifications:

MIL-H-6088	-Heat Treatment of Aluminum Alloys.
MIL-I-8950	-Inspection, Ultrasonic, Wrought Metals; Process for.

Military Standards:

MIL-STD-105	-Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-649	-Aluminum and Magnesium Products; Preparation for Shipment and Storage.

(Copies of Military Specifications and Standards, required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM) Standards:

ASTM B 342	-Electrical Conductivity by Use of Eddy Currents.
ASTM B 557	-Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products.
ASTM G 34	-Exfoliation Corrosion Susceptibility in 7XXX Series Copper Containing Aluminum Alloys (EXCO Test).
ASTM G 47	-Determining Susceptibility to Stress-Corrosion Cracking of High-Strength 7XXX Series Aluminum Alloy Products.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

American National Standards Institute (ANSI) Standards:

- | | |
|------------|---|
| ANSI H35.1 | -Alloy and Temper Designation System for Aluminum. |
| ANSI H35.2 | -Dimensional Tolerances for Aluminum Mill Products. |

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., Traffic Department, 1616 P Street, N.W., Washington, DC 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable detailed specification.

3.2 Chemical composition. The chemical composition shall be as specified in the detailed specification.

3.3 Mechanical properties.

3.3.1 Mechanical properties shall be as specified in the detailed specification. The elongation requirements shall not be applicable to the following:

- a. Material of such dimensions that a standard test specimen cannot be taken in accordance with this specification, and of such shape that it cannot be satisfactorily tested in full section.
- b. Material thinner than 0.062 inch (nominal).

3.4 Dimensional tolerances. Unless otherwise specified, the dimensional tolerances shall not exceed those specified in ANSI H35.2.

3.5 Requirements for sizes not specifically covered. Mechanical properties for sizes not covered by the detailed specification and dimensional tolerances for sizes not covered in ANSI H35.2 shall be as specified in the contract or order (see 6.2).

3.6 Electrical conductivity. When specified in the detailed specification, the electrical conductivity shall conform to the requirements in the detailed specification (see 4.4.3).

3.7 Exfoliation corrosion. When specified in the detailed specification, bars, rods and shapes processed to meet the applicable mechanical property and electrical conductivity requirements, shall show a level of exfoliation corrosion no worse than that illustrated by code EA, fig. 3, of ASTM G 34 when tested as specified in the detailed specification or purchase order. The supplier shall maintain records of all lots so tested.

3.8 Stress corrosion cracking. When stress corrosion testing is specified in the detailed specification or purchase order, bars, rods and shapes of sufficient thickness, processed to meet the applicable mechanical property and electrical conductivity requirements specified in the detailed specification shall show no evidence of stress corrosion cracking (see 4.4.5) when tested at the stress level specified in the detailed specification. The supplier shall maintain records of the performance of all lots so tested.

3.9 Marking for identification. Bar, rod, shapes, structural shapes, tube, and wire shall be marked in accordance with Fed. Std. No. 184 and the detailed specification as required (see 6.3).

3.10 Heat treatment. Unless otherwise specified in the detailed specification, contract, or order, heat treatment for the applicable tempers designated in the detailed specifications shall be in accordance with the applicable requirements of MIL-H-6088.

3.11 Internal defects. When specified in the detailed specification, rod, bar, and shapes shall be inspected ultrasonically for internal defects (see 4.3.2).

3.12 Tube. When tube is specified in the contract or purchase order, only seamless tube shall be supplied. If supplier cannot supply seamless tube, he shall notify the procuring activity.

3.13 Workmanship. The bar, rod, shapes, structural shapes, tube, and wire shall be uniform in quality, temper and condition; clean, sound, smooth, and free from hard and soft spots, pipes, laps, cracks, seams, kinks, damaged ends and other injurious defects within the limits consistent with best commercial practice. Discoloration due to thermal treatment will not be cause for rejection.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Sampling.

4.2.1 Inspection lot. An inspection lot shall be as follows:

4.2.1.1 Heat-treated material. For heat-treated tempers, an inspection lot shall consist of an identifiable quantity of material of the same mill form, alloy, temper, section and size traceable to a heat-treated lot and subjected to inspection at one time.

4.2.1.2 Non-heat-treated material. For non-heat-treated tempers, an inspection lot shall consist of an identifiable quantity of material of the same mill form, alloy, temper, section and size subjected to inspection at one time.

4.2.2 Sampling for chemical analysis.

4.2.2.1 Ingot analysis. At least one sample shall be taken from each group of ingots of the same alloy poured simultaneously from the same source of molten metal by the producer and analyzed to determine conformance with 3.1. Ingots not conforming to the requirements of this specification shall be rejected. Complete ingot analysis records shall be available at the producer's plant to the procuring activity.

4.2.2.2 Finish product analysis. When compliance with 4.2.2.1 cannot be established, samples shall be selected as follows: From material having a nominal weight of less than one pound per lineal foot, one sample shall be selected from each lot weighing 1,000 pounds or less; from lots weighing more than 1,000 pounds, one additional sample shall be taken for each 1,000 pounds of fraction thereof in excess of the first 1,000 pounds. From material having a nominal weight of one pound or more per lineal foot, one sample shall be taken from each lot consisting of 1,000 feet, or less; from lots consisting of more than 1,000 feet, one additional sample shall be taken for each 1,000 feet or fraction thereof in excess of the first 1,000 feet. Only one test specimen shall be taken from any one piece when more than one piece is available. Not more than one analysis shall be required per piece to determine conformance to 3.1.1.

4.2.3 Samples for mechanical property tests.

4.2.3.1 Samples for tensile tests.

4.2.3.1.1 Number of test samples in temper supplied. From material having a nominal weight of less than one pound per lineal foot, one tension test sample shall be selected from each inspection lot weighing 1,000 pounds or less; from inspection lots weighing more than 1,000 pounds, one additional sample shall be taken for each 1,000 pounds or fraction thereof in excess of the first 1,000 pounds. From material having a nominal weight of one pound or more per lineal foot, one tension-test sample shall be taken from each inspection lot consisting of 1,000 feet, or less; from inspection lots consisting of more than 1,000 feet, one additional sample shall be taken from each 1,000 feet or fraction thereof in excess of the first 1,000 feet. Only one tension-test specimen shall be taken from any one piece when more than one piece is available.

4.2.4 Sampling for electrical conductivity tests. Sampling shall be in accordance with 4.2.3.

4.2.5 Sampling for exfoliation and stress corrosion tests. Two samples shall be taken from each 4,000 pounds or less of the first three production lots of each of the applicable tempers for each thickness or diameter range listed in the table of minimum mechanical properties in the detailed specification, and for shapes with width to thickness ratios of up through 6 and of over 6 within the thickness ranges. Thereafter, surveillance testing shall be performed on at least one sample per month of the applicable tempers for each thickness or diameter range listed in the table of minimum mechanical properties in the detailed specification produced during the month, and for shapes with width to thickness ratios of up through 6 and over 6 within the thickness ranges produced during the month, unless otherwise specified in the detailed specification or purchase order.

4.2.6 Sampling for visual and dimensional examination. Each bar, rod, shape, structural shape, tube, and wire shall be examined to determine conformance to this specification with respect to workmanship and identification marking. Examinations for dimensions shall be made to insure conformance with the tolerances specified. On approval of the procuring activity, the supplier may use a system of statistical quality control on each inspection lot for dimensional, marking, and workmanship examinations.

4.3 Examination.

4.3.1 Visual and dimensional examination. Each sample bar, rod, shape, structural shape, tube, or wire selected in accordance with 4.2.6 shall be visually examined and measured to verify conformance with this specification.

4.3.2 Ultrasonic inspection. When specified in the detailed specification, rod, bar, and shapes shall be inspected for internal defects in accordance with MIL-I-8950. Acceptance standards shall be as specified in the detailed specification.

4.3.3 Examination of preparation for delivery. When required, an examination shall be made by a representative of the procuring activity to determine compliance with the requirement of section 5. The sample unit shall be one shipping container fully prepared for delivery. Sampling shall be in accordance with MIL-STD-105. The inspection level shall be S-2 with an AQL of 4.0 expressed in terms of percent defective (see 6.2). A lot shall be as specified in MIL-STD-649.

4.4 Test Procedures.

4.4.1 Chemical analysis. Chemical analysis shall be made by the wet chemical method in accordance with method 111 of Fed. Test Method Std. No. 151 or by the spectrochemical method in accordance with method 112 of Fed. Test Method Std. No. 151.

4.4.2 Mechanical testing.

4.4.2.1 Types of test specimens. Specimens for tensile testing shall conform to the requirements of ASTM B 557. When practicable, wire and other material should be tested in full section. For bar, rod, shapes, or structural shapes which are not tested in full section, a standard 0.500 inch diameter round tension test specimen shall be used, or small size specimens proportional to the standard having a nominal diameter of 0.350 inch or 0.250 inch. A standard rectangular tension test specimen with 2 inch gage length may also be used. For tube less than 0.500 inch in wall thickness, which is not tested in full section, the standard 1/2 inch wide longitudinal tension test specimen (figure 12 of ASTM B 557) for large diameter tubular products shall be used. For tube having a wall thickness of 0.500 inch or more, a standard 0.500 inch diameter round tension test specimen shall be used, or small size specimens proportional to the standard having a nominal diameter of 0.350 inch or 0.250 inch. For material which cannot be tested in full section and from which a standard specimen cannot be obtained, a strip cut from the material shall be tested.

4.4.2.2 Location of test specimens.

4.4.2.2.1 Rod, bar, shapes and structural shapes. For sections which are wholly or predominantly symmetrical, the tension test specimens shall be taken from the locations specified in table I. For sections of which the predominant part is unsymmetrical, the specimen shall be taken from a location that most nearly satisfies the intent of table I. Unless otherwise specified in the contract or order, for odd-shaped sections, only the predominant part shall be tested.

TABLE I. Location of axis of specimen.

Section thickness or width (inches)	Location of axis of specimen with respect to thickness (T) and width (W) of section	
	Thickness	Width
Up thru 1.500, incl	T/2	W/2
Greater than 1.500	T/4	W/4

4.4.2.2.2 Tube. Tension test specimens shall be taken from the tube in the longitudinal direction as specified in the detailed specification. From tube in wall thicknesses 0.5 to 1.5 inches, inclusive, tension-test specimens shall be taken with the axis midway between the inside and outside diameter surfaces; from tube having wall thickness greater than 1.5 inches, the axis of the tension-test specimen shall be three fourths of the distance from one surface to the other.

4.4.2.3 Tensile tests.

4.4.2.3.1 Tensile strength. Tensile strength shall be determined in accordance with ASTM B 557.

4.4.2.3.2 Yield strength. The yield strength shall be determined in accordance with ASTM B 557.

4.4.3 Electrical conductivity. Unless otherwise specified in the detailed specification or purchase order, electrical conductivity shall be determined in accordance with ASTM B 342. Test specimens may be prepared by the method of the latter specification by machining a flat, smooth surface of sufficient width for proper testing. Chemical milling may be used on flat surface samples.

4.4.4 Resistance to exfoliation corrosion. Specimens shall be prepared and tested in accordance with ASTM G 34 unless otherwise specified in the detailed specification or purchase order. Approximately 10 percent of the thickness shall be removed from one surface by machining and the machined surface shall be evaluated after the test. Chemical milling may be used instead of machining.

4.4.5 Resistance to stress corrosion cracking. Specimens shall be prepared and tested in accordance with ASTM G 47 unless otherwise specified in the detailed specification or purchase order.

4.5 Rejection and retest. If any specimen fails to conform to the requirements of this specification, it shall be cause for rejection of the material represented by the specimen subject to the retest provisions of Fed. Test Method No. 151. When no sampling plan is provided, or approved by the procuring agency, and when there is evidence that indicates that a failed specimen was not representative of the lot of material, and when the

detail specification does not specify otherwise, at least two specimens shall be selected to replace each test specimen which failed. All specimens so selected for retest shall meet the requirements of the specification or the lot shall be rejected.

5. PREPARATION FOR DELIVERY

5.1 Preservation. Preservation shall be level A, B or commercial, as specified (see 6.2).

5.1.1 Level A. The aluminum alloy product shall be preserved in accordance with level A preservation requirements of MIL-STD-649.

5.1.2 Level B. The aluminum alloy product shall be preserved in accordance with level B preservation requirements of MIL-STD-649.

5.1.3 Commercial. Items shall be given the best degree of protection employed by the supplier to afford protection against corrosion, deterioration and damage during shipment.

5.2 Packing. Packing shall be level A, B, or commercial, as specified (see 6.2).

5.2.1 Level A. The aluminum alloy product preserved as specified in 5.1 shall be packed in accordance with the level A packing requirements of MIL-STD-649.

5.2.2 Level B. The aluminum alloy product preserved as specified in 5.1, shall be packed in accordance with the level B packing requirements of MIL-STD-649.

5.2.3 Commercial. Items shall be packed in the same manner employed by the supplier to afford protection against damage during shipment and must, as a minimum, meet carrier rules and regulations. Weight per shipping unit shall be as specified by the procuring activity at the time of procurement.

5.3 Marking.

5.3.1 Civil agencies. Marking shall be in accordance with Federal-STD-123 and as specified in the contract or order.

5.3.2 Military activities. Marking for shipment shall be as specified in MIL-STD-649.

6. NOTES

6.1 Intended use. (See detailed specification.)

6.2 Ordering data. (See detailed specification.)

6.2.1 Examination for preparation for delivery, when applicable (see 4.3.3).

6.3 The following detailed specifications have been issued for bar, rod, shapes, structural shapes, tube and wire: The former specification number is indicated in parenthesis.

QQ-A-200/1	-Aluminum Alloy 3003, Bar, Rod, Shapes, Tube and Wire, Extruded. (QQ-A-357).
QQ-A-200/2	-Aluminum Alloy 2014, Bar, Rod, Shapes, Tube and Wire, Extruded. (QQ-A-261).
QQ-A-200/3	-Aluminum Alloy 2024, Bar, Rod, Shapes, Tube and Wire, Extruded. (QQ-A-267).
QQ-A-200/4	-Aluminum Alloy 5083, Bar, Rod, Shapes, Tube and Wire, Extruded. (MIL-A-19005).
QQ-A-200/5	-Aluminum Alloy 5086, Bar, Rod, Shapes, Tube and Wire, Extruded. (MIL-A-21579).
QQ-A-200/6	-Aluminum Alloy 5454, Bar, Rod, Shapes, Tube and Wire, Extruded. (MIL-A-21599).
QQ-A-200/7	-Aluminum Alloy 5456, Bar, Rod, Shapes, Tube and Wire, Extruded. (MIL-A-21170).
QQ-A-200/8	-Aluminum Alloy 6061, Bar, Rod, Shapes, Tube and Wire, Extruded. (QQ-A-270).
QQ-A-200/9	-Aluminum Alloy 6063, Bar, Rod, Shapes, Tube and Wire, Extruded. (QQ-A-274).
QQ-A-200/10	-Aluminum Alloy 6066, Bar, Rod, Shapes, Tube and Wire, Extruded. (MIL-A-25493).
QQ-A-200/11	-Aluminum Alloy 7075, Bar, Rod, Shapes, Tube and Wire, Extruded, (QQ-A-277).
QQ-A-200/13	-Aluminum Alloy 7178, Bar, Rod, Shapes, Tube and Wire, Extruded. (MIL-A-9186).
QQ-A-200/14	-Aluminum Alloy 7178-T76, Bar, Rod, Shapes and Wire, Extruded, (Exfoliation Resistant).

QQ-A-200/15	-Aluminum Alloy 7075, Bar, Rod and Shapes, Extruded, (Exfoliation Resistant).
QQ-A-200/16	-Aluminum Alloy 6061, Structural Shapes, Extruded.
QQ-A-200/17	-Aluminum Alloy 6162, Bar, Rod, Shapes, Tube and Wire, Extruded.

6.4 Definitions.

6.4.1 Bar. A solid section, long in relation to its cross-sectional dimensions, having a symmetrical cross-section that is square or rectangular (excluding flattened wire) with sharp or rounded corners or edges, or is a regular hexagon or octagon, and whose width or greatest distance between parallel faces is 3/8 inch or greater.

6.4.2 Rod. A solid round section 3/8 inch or greater in diameter, whose length is long in relation to its diameter.

6.4.3 Shape. A wrought product that is long in relation to its cross-sectional dimensions, and has a cross-section other than that of sheet, plate, wire, rod, bar, tube or structural shape. The thickness of any element of a shape shall be deemed to be the smallest dimension of that element.

6.4.4 Structural shape. An extruded shape in certain standard alloys tempers, sizes, and sections, such as angles, channels, tees, zees, I-beams, and H-sections, commonly used for structural purposes.

6.4.5 Tube. A hollow wrought product that is long in relation to its cross-section which is symmetrical and is round, square, rectangular, hexagonal, octagonal, or elliptical, with sharp or rounded corners, and that has uniform wall thickness except as affected by corner radii.

6.4.6 Wire. A solid wrought product that is long in relation to its symmetrical cross-section which is square or rectangular (excluding flattened wire) with sharp or rounded corners or edges, or is round, hexagonal, or octagonal. This product has a diameter, width, or greatest distance between parallel faces of less than 3/8 of an inch.

6.5 Certain provisions of this specification are the subject of international standardization agreement ABC-NAVY-STD-44. When amendment, revision, or cancellation of this specification is proposed which will affect or violate the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization channels including departmental standardization offices, if required.

QQ-A-200E/GEN

MILITARY INTEREST: .

CIVIL AGENCY COORDINATING ACTIVITIES:
GSA - FSS

Custodians:

Army-MR
Navy-AS
Air Force-11

Review activities:

Army-AR, EA, GL, MI
Navy-OS, YD
Air Force-99
DLA-IS

PREPARING ACTIVITY
NAVY - AS

User activities:

Army-CR
Navy-MC, EC, SH

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